Electronic Version
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Claims

[c1] What is claimed is:

1. A device for converting and mixing a plurality of video data, the video data having a plurality of sampling formats, the sampling formats at least comprising a high chrominance-sampling-rate format and a low chrominance-sampling-rate format, the device comprising:
a first data receiving end for receiving a first video data in the low chrominance-sampling-rate format;
a second data receiving end for receiving a second video data in the high chrominance-sampling-rate format;
a format converting module electrically connected to the first data receiving end for up-sampling the first video data to convert the first video data in the low chrominance-sampling-rate format into a first video data in the high chrominance-sampling-rate format; and
a data mixer electrically connected to the format converting module and the second data receiving end for mixing the first video data in the high chrominance-sampling-rate format with the second video data in the high chrominance-sampling-rate format to generate a mixed video data in the high chrominance-sampling-rate format.

[c2] 2. The device of claim 1 further comprising a TV encoder electrically connected to the data mixer for converting the mixed video data in the high chrominance-sampling-rate format into a TV video signal.

[c3] 3. The device of claim 1 being applied to an MPEG-1 decoder, an MPEG-2 decoder, or a JPEG decoder, wherein the first video data, the second video data, the mixed video data, the high chrominance-sampling-rate format, and the low chrominance-sampling-rate format comply with MPEG-1 and MPEG-2 standards.

[c4] 4. The device of claim 3 wherein the first video data is a main-picture video data stored in a VCD disc or a DVD disc, and the second video data is a sub-picture (SP) video data or an on-screen display (OSD) video data stored in the VCD disc or the DVD disc.

[c5] 5. The device of claim 3 wherein the high chrominance-sampling-rate format is a 4:4:4 sampling format according to the MPEG-1 and MPEG-2 standards, and the low chrominance-sampling-rate format is a 4:2:0 sampling format according to the MPEG-1 and MPEG-2 standards.

[c6] 6. The device of claim 5 wherein the sampling formats further comprise a middle chrominance-sampling-rate format, the middle chrominance-sampling-rate format is

a 4:2:2 sampling format according to the MPEG-1 and MPEG-2 standards, and the format converting module further comprises:

a first middle format converter for up-sampling the first video data in the low chrominance-sampling-rate format to convert the first video data into an intermediate video data in the middle chrominance-sampling-rate format; and

a second middle format converter electrically connected to the first middle format converter for up-sampling the intermediate video data in the middle chrominance-sampling-rate format to convert the intermediate video data into the first video data in the high chrominance-sampling-rate format.

[c7] 7. A video data processing device comprising:

a main-picture video data receiving end for receiving a main-picture video data in a 4:2:2 sampling format, wherein the main-picture video data in the 4:2:2 sampling format comprises a main luminance value and a main chrominance value;

a supplementary video data receiving end for receiving a supplementary video data in a 4:4:4 sampling format, wherein the supplementary video data in the 4:4:4 sampling format comprises a sub luminance value, a first sub chrominance value, and a second sub chrominance

value;

a format converting module electrically connected to the main-picture video data receiving end for up-sampling the main-picture video data in the 4:2:2 to convert the main-picture video data into a main-picture video data in the 4:4:4 sampling format, wherein the main-picture video data in the 4: 4: 4 sampling format comprises a main luminance value, a first main chrominance value, and a second main chrominance value;

a data mixer electrically connected to the format converting module and the supplementary video data receiving end for mixing the main-picture video data in the 4:4:4 sampling format with the supplementary video data in the 4:4:4 sampling format to generate a mixed video data in the 4:4:4 sampling format; and

a TV encoder electrically connected to the data mixer for converting the mixed video data in the 4:4:4 sampling format into a TV video signal.

[c8] 8. The video data processing device of claim 7 wherein the data mixer respectively mixes the main luminance value with the sub luminance value, the first main chrominance value with the first sub chrominance, and the second main chrominance value with the second sub chrominance value to generate a mixed luminance value, a first mixed chrominance value, and a second mixed

chrominance value through a mathematical combination.

[c9] 9. The video data processing device of claim 8 wherein the mixed video data in the 4:4:4 sampling format comprises the mixed luminance value, the first mixed chrominance value, and the second mixed chrominance value.

[c10] 10. The video data processing device of claim 7 further comprising a sampling format converter electrically connected to the main-picture video data receiving end for converting a main-picture video data in a 4:2:0 sampling format into the main-picture video data in the 4:2:2 sampling format.

[c11] 11. The video data processing device of claim 7 wherein the main-picture video data is stored in a VCD disc or a DVD disc, and the supplementary video data is a sub-picture (SP) video data or an on-screen display (OSD) video data stored in the VCD disc or the DVD disc.

[c12] 12. The video data processing device of claim 7 complying with an MPEG 1 standard, an MPEG-2 standard, or a JPEG standard.

[c13] 13. A method for converting and mixing a plurality of video data without data loss, the video data having a plurality of sampling formats, the sampling formats at

least comprising a high chrominance-sampling-rate format and a low chrominance-sampling-rate format, the method comprising:

receiving a first video data in the low chrominance-sampling-rate format and a second video data in the high chrominance-sampling-rate format;

converting the first video data in the low chrominance-sampling-rate format into a first video data in the high chrominance-sampling-rate format; and

mixing the first video data in the high chrominance-sampling-rate format with the second video data in the high chrominance-sampling-rate format for generating a mixed video data in the high chrominance-sampling-rate format.

[c14] 14. The method of claim 13 being applied to an MPEG-1 decoder, an MPEG-2 decoder, or a JPEG decoder, wherein the first video data, the second video data, the mixed video data, the high chrominance-sampling-rate format, and the low chrominance-sampling-rate format comply with MPEG-1 and MPEG-2 standards.

[c15] 15. The method of claim 14 wherein the first video data is a main-picture video data stored in a VCD disc or a DVD disc, and the second video data is a sub-picture (SP) video data or an on-screen display (OSD) video data stored in the VCD disc or the DVD disc.

[c16] 16. The method of claim 14 wherein the sampling formats further comprises a middle chrominance-sampling-rate format, and the method further comprises:
converting the first video data in the low chrominance-sampling-rate format into an intermediate video data in the middle chrominance-sampling-rate format; and
converting the intermediate video data in the middle chrominance-sampling-rate format into the first video data in the high chrominance-sampling-rate formats;
wherein the middle chrominance-sampling-rate format conforms to the MPEG-1 and MPEG-2 standards.

[c17] 17. The method of claim 16 wherein the high chrominance-sampling-rate format is a 4:4:4 sampling format according to the MPEG-1 and MPEG-2 standards, the middle chrominance-sampling-rate format is a 4:2:2 sampling format according to the MPEG-1 and MPEG-2 standards, and the low chrominance-sampling-rate format is a 4:2:0 sampling format according to the MPEG-1 and MPEG-2 standards.

[c18] 18. A method for driving a video data processing device to process at least a video data, the video data processing device comprising a data receiving end, a format converting module, and a data mixer, the method comprising:

utilizing the data receiving end to receive a main-picture video data in a 4:2:2 sampling format and a supplementary video data in a 4:4:4 sampling format;
utilizing the format converting module to convert the main-picture video data in the 4:2:2 sampling format into a main-picture video data in the 4:4:4 sampling format; and
utilizing the data mixer to mix the main-picture video data in the 4:4:4 sampling format with the supplementary video data in the 4:4:4 sampling format for generating a mixed video data in the 4:4:4 sampling format.

[c19] 19. The method of claim 18 wherein the video data processing device further comprises a TV encoder electrically connected to the data mixer, and the method further comprises utilizing the TV encoder to convert the mixed video data in the 4:4:4 sampling format into a TV video signal.

[c20] 20. The method of claim 18 wherein the video data processing device further comprises a sampling format converter electrically connected to the data receiving end for converting a main-picture video data in a 4:2:0 sampling format into the main-picture video data in the 4:2:2 sampling format.

[c21] 21. The method of claim 18 wherein the main-picture

video data in the 4:2:2 sampling format comprises a main luminance value, a first main chrominance value, and a second main chrominance value, the supplementary video data in the 4:4:4 sampling format comprises a sub luminance value, a first sub chrominance value, and a second sub chrominance value, the main-picture video data in the 4:4:4 sampling format comprises a main luminance value, a first main chrominance value, and a second main chrominance value, and the mixed video data in the 4:4:4 sampling format comprises a mixed luminance value, a first mixed chrominance value, and a second mixed chrominance value.

[c22] 22. The method of claim 21 further comprising:
utilizing the format converting module to up-sample the first main chrominance value and the second main chrominance value of the main-picture video data in the 4:2:2 sampling format for generating the first main chrominance value and the second main chrominance value of the main-picture video data in the 4:4:4 sampling format; and
utilizing the data mixer to respectively mix the main luminance value with the sub luminance value, the first main chrominance value with the first sub chrominance value, and the second main chrominance value with the second sub chrominance value for generating the mixed

luminance value, the first mixed chrominance value, and the second mixed chrominance value through a mathematical combination.

[c23] 23. The method of claim 18 wherein the main-picture video data is stored in a VCD disc or a DVD disc, and the sub-picture video data is a sub-picture (SP) video data or an on-screen display (OSD) video data stored in the VCD disc or the DVD disc.

24. The method of claim 18 being applied to an MPEG-1 decoder or an MPEG-2 decoder.